



MANAGERIAL ECONOMICS

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Lecture No - 23 : Economies of Scale

Recap from last Session

- Contribution Analysis
- Learning Curve

Session Outline

- Application of Cost Analysis
- Cost Function: Empirical Determination
- Economies of Scale

Application of Cost Analysis: Optimum output level

Optimum output has reference to that level of (size) of output which minimizes the average cost of Production, or for which the average cost is equal to marginal cost.

Example:

Application of Cost Analysis: Optimum Inventory level

All productions are not immediately sold – Inventory

Optimum inventory level is defined as that size of stock for which the average cost of inventory held is at minimum.

Application of Cost Analysis: Optimum Inventory level

Two types cost are involved:

Carrying Cost: includes storage cost, interest cost on borrowed capital to finance stock etc.

Application of Cost Analysis: Optimum Inventory level

Two types cost are involved:

Reorder cost: includes book keeping costs, telephone charges and some variable cost

Application of Cost Analysis: Optimum Inventory level

Average cost of inventory

$$AC = (K \cdot d/2) + (F, V, D)S/D$$

Carrying Cost + Reorder Cost

S = Expected Sale, D – Order Quantity to be Delivered/D = Number of Orders delivered, F = Average Fixed cost of delivery,

V = Coefficient of AVC of reorder, K = Average Carrying Cost,

D/2 = average inventory held between initial and terminal periods and it is assumed that the demand is spread evenly

Application of Cost Analysis: Optimum Inventory level

For deciding an optimum inventory held,

$$= d(AC)/dD = (K/2 - FS/D^2) = 0$$

= $D = \sqrt{2FS/K} \rightarrow$ Optimum size of stock/ Economic Order Quantity

Application of Cost Analysis: Optimum Scale

The optimum scale is given by that value of K(Plant Size) at which the total cost is the least.

Necessary Condition = $dC/dK = 0$

Sufficient Condition = $d^2C/dK^2 > 0$

Example

Economies of Scale

- The advantages of large scale production that result in lower unit (average) costs (cost per unit)
- $AC = TC / Q$
- Economies of scale – spreads total costs over a greater range of output

Types

Pecuniary Economies: Economies realized from paying lower prices for the factor used in production and distribution of the product, due to bulk buying by the firm as its size increases.

Types

Real Economies: Associated with a reduction in the physical quantity of inputs, raw materials, various types of labor and various types of capital.

- Production Economies
- Selling and Marketing Economies
- Managerial Economies
- Transport and Storage Economies

Production Economies

It may arise from the factor

1. Labor
2. Fixed capital
3. Inventory requirement of firm

Production Economies – Labor Economies

1. Specialization
2. Time saving
3. Automation of Production process
4. Cumulative volume Economies

Production Economies – Labor Economies - Specialization

Large scale allow division of labor and specialization of labor force with the result of improvement of the skill and hence productivity of various types of labour. – which results in saving of the time usually lost in going from one type of work to another.

Production Economies- Labor Economies - Time saving
Division of labour, apart from increasing the skills of labor force , results in saving of time usually lost in going from one type of work to another.

Production Economies – labor Economies - Automation of Production Process

Division of labour promotes the invention of tools and machine which facilitate and supplement the workers.

Mechanization of the production methods in large plant increases the labor productivity and leads to decreasing costs as the scale of output increases.

Production Economies – labor Economies - Cumulative volume Economies

With increase in scale there is cumulative effect on the skills of technical personnel in particular.

Production engineer, foreman and other production employee tend to acquire considerable experience from large scale operations.

Cumulative volume experience leads to higher productivity and hence to reduced costs at larger level of output.

Production Economies – Technical Economies

These economies are associated with the fixed capital which includes all types of machinery and other equipment. It arises from

1. Specialization and indivisibilities of Capital
2. Set up costs
3. Initial fixed cost
4. Technical volume/input relations
5. Reserve capacity requirements

Production Economies – Technical Economies - Specialization and Indivisibilities of Capital

Technical economies result

- from the specialization of capital equipment which becomes possible at large scales of production and
- from indivisibilities which are a character of modern industrial technique of production.

Production Economies – Technical Economies -Specialization and Indivisibilities of Capital

Modern technology - higher degree of mechanization – capital intensive production method at a large scale of production .

High over head cost- lower variable cost

Production Economies – Technical Economies --Specialization and indivisibilities of Capital

Low level of output –highest average fixed cost more than offset the lower labor costs.

Once the appropriate scale is reached the highly mechanized and specialized technique become profitable.

Production Economies – Technical Economies -Set up costs

Cost involved in the preparation of multi-purpose machinery for performing the particular job or product.

In motor car industry or in firm producing electrical household equipment in the use of general purpose machine is quite common.

Example : Metal Stamping press which produces frames and various components of the final product.

Production Economies – Technical Economies -Set up costs

The metal stamping press has to be reset any time that a particular part of car has to be produced.

For example, different set ups are required for producing the doors, the roof, the wings of a car, each set up involves considerable time and cost.

Production Economies – Technical Economies -Set up costs

The larger the scale of the output the more a multi purpose machine is left to one set up and hence resetting becomes less frequent – which is a source of technical economies of scale.

Production Economies – Technical Economies -Initial fixed cost

It is usually involved in starting a business or introducing a new product.

Research and Development expenditures, cost of Market explorations, design costs for the product are examples of such costs.

Larger the scale of output, the lower the unit cost of such fixed expenses.

Production Economies – Technical Economies - Technical volume/input relations

Technical Economies arise from some technical-geometric relationships between particular equipment and the inputs required to produce and install it.

Important in process industries – includes special equipment such as storage tanks, reaction chambers, connecting pipes etc.

Production Economies – Technical Economies - Technical volume/input relations

The material and labor costs of constructing such plants are proportional to the surface area that they occupy.

The volume capacity, which determines the level of output of plant increases more than proportionately as the area increases.

Production Economies – Technical Economies Technical volume/input relations

The technical cost of unit capacity of installing such industrial plant falls as the output capacity increases, at least up to the point where equipment becomes so large as to require stronger materials and special constructions in order to make the larger plant safe.

Production Economies – Technical Economies

Reserve capacity requirements

Firms always want some reserve capacity in order to avoid disruption of their production flow when breakdown of machinery occurs.

A small firm which uses single large machine will have to keep two such machines if it wants to avoid disruptions from a breakdown.

Production Economies – Inventory Economies

Also called as stochastic economies because the role of inventories is to meet the random changes in the input and the output sides of operation of firm.

Stock of raw materials do increase with scale but not proportionately. Random fluctuations in the supply of such inputs are smoothed out with stocks whose size need change by less than the size of the firm.

Production Economies – Inventory Economies

On the demand side, random changes in the demand of customers will tend to be smoothed out as the plant increases. The larger the number of customers the more the random fluctuations of their demands tend to offset peaks and recessions, thus allowing firm to hold smaller percentage of its output to meet random changes.

Selling and Marketing Economies

Associated with the distribution of the product of a firm.

Advertising economies

Not only new firm also for existing firm

Selling and Marketing Economies

Advertising space and time increase less than proportionately with scale, so advertising cost per unit of output falls with scale.

Advertising budget is usually decided on the basis of available funds, profits, similar activities of competitors, rather than on the basis of output.

Larger the output the smaller the advertising cost per unit.

Selling and Marketing Economies -other large scale economies

Other selling activities like salesman force, the distribution of samples etc. - such small scale promotion expenditure increase by less than proportionately with output at least up to a certain scale.

Selling and Marketing Economies -Economies from special arrangement with exclusive dealers

Large firm can enter exclusive agreements with distributors, who undertake the obligation of maintaining a good service department for the product of the manufacture.

Automobile industry, where the dealer builds up Garages and keep regular stocks of spare parts for various models.

The buyers of durable pays a lot of attention to the availability of spares and good servicing shops for the brand they buy.

Selling and Marketing Economies -Model change economies

There is a need to change the style of the product to meet the demand of customers and the competition of the rival firms – which involves considerable expenses in R&D and new materials and equipment.

The spreading of such overheads is lower per unit if the scale of output is large.

Selling and Marketing Economies

There is general agreement that large scale marketing economies do exist, at least up to a certain size of the plant .

Disagreement exists as to whether the average selling cost curve turns at very large economies of output or whether the unit selling cost falls continuously with scale.

Given that the technical costs of production fall with scale, the total average cost may eventually turn upwards if selling diseconomies do exist after a certain plant size

Managerial Economics

Managerial cost are partly production cost and partly selling cost.

Managerial economies arising because of

- Specialization of Management
- Mechanization of Managerial functions

Managerial Economies

Division of Managerial task – increases the experience of managers in their areas of responsibility – more efficient working of firm.

Decentralization of decision making – increase the efficiency of management – avoid managerial diseconomies

Managerial Economics

High degree of mechanization – save time in the decision making process and speed up processing of information, accuracy .

Traditional theory postulated that beyond certain stage increases in management lead to less than proportionate increases in output and thus cause an increase in long run unit costs.

Managerial Economics

The decrease in efficiency of management is usually attributed to :

- Loss of control of the top management once firm has surpassed an optimum size.
- The uncertainty from the market conditions and the reactions of the competitors increases with size and this leads to eventually less efficient decision making.

Transport and Storage Economies

Transport and storage cost are incurred partly on the production side and partly on the selling side.

Storage cost will clearly fall with the size – but will be scalloped due to technical indivisibilities and discontinuities.

Transport and Storage Economies

Storing capacity can normally be increased to a certain level, beyond this the additional construction will increase total cost – but unit cost will normally be lower the larger the output.

Transport and Storage Economies

If the firm uses own transport means, transport unit costs would fall up to the point of their full capacity.

If the firm uses public transport the unit costs would normally increase with distance

Pecuniary Economies of Scale

- These are economies accruing to the firm due to discounts that it can obtain due to its large scale operations.
- Lower price of its raw materials, bought at special discounts from its supplier
- Lower cost of external finance. Bank usually offer loans to large corporations at a lower rate of interest and other favorable items.

Pecuniary Economies of Scale

- Lower advertising prices may be granted to larger firms if they advertise at larger scale.
- Transport rates are often lower if the amounts of goods transported are large.
- Finally larger firm may be able to pay lower earning to their workers if they attain a size which gives them monopolistic power or due to prestige associated with the employment by a large.

External Economies of Scale

The advantages firms can gain as a result of the growth of the industry – normally associated with a particular area.

- Supply of skilled labour
- Reputation
- Local knowledge and skills
- Infrastructure
- Training facilities

There are likely to be limits to economies of scale.
How large can machinery get?
How large can markets get?

Diseconomies of scale

Business can become too large. Unit costs can then tend to rise.

Causes:

Communication – hierarchical structure, information overload, formal methods, less face to face, language.

Co-ordination – different departments must work towards same goals.

Motivation – being a small fish in a big pond syndrome. Less contact with senior managers.

Technical diseconomies – if a large machine breaks down production costs can rise.

Diseconomies of scale

The disadvantages of large scale production that can lead to increasing average costs

Problems of management

Maintaining effective communication

Co-ordinating activities – often across the globe!

De-motivation and alienation of staff

Divorce of ownership and control

Do diseconomies exist?

Evidence suggests that unit costs may not rise as the scale of production increases beyond an optimum scale.

Economies of Scope

Scope economies exist if the joint costs of producing two or more products is less than the separate costs of producing each individually.

An example might be an auto air conditioning repair shop that adds radiator/cooling system repairs

Session References

Micro Economics : ICFAI University Press